

REMARKS

Applicants thank the Examiner for the very thorough consideration given the present application. Claims 1 and 3-20 are currently pending in this application. Claims 3 and 4 have been withdrawn from further consideration. No new matter has been added by way of the present amendment. For instance, the amendment to claim 1 is supported by the Specification at, for example, page 15, lines 24-28, and page 21, lines 29-32. The amendment to the Specification is merely editorial in nature. Accordingly, no new matter has been added.

At the outset, the present application is believed to be in condition for allowance. Entry of the accompanying amendment is requested under 37 C.F.R. §1.116, as the amendment does not raise any new issues which would require further search and/or consideration by the Examiner. Furthermore, Applicants request entry of this amendment in order to place the claims in better form for consideration on Appeal.

In view of the amendments and remarks herein, Applicants respectfully request that the Examiner withdraw all outstanding rejections and allow the currently pending claims.

Issues Under 35 U.S.C. § 103(a)

Claims 1, 5-14 and 17-20

Claims 1, 5-14 and 17-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fenton et al. (U.S. 6,456,136) (hereinafter Fenton '136). Applicants respectfully traverse.

The Examiner asserts that Fenton '136 discloses a composite membrane structure comprising a porous polymeric matrix and a protective layer disposed adjacent to the porous polymeric matrix. The Examiner appears to take the position that Fenton's porous polymeric

layer and protective layer are equivalent to Applicants' "porous film layer" and "surface layer", respectively. The Examiner further asserts that the porous polymeric layer has a pore diameter of 0.025 μ m to about 1 μ m. Additionally, the Examiner asserts that the protective layer comprises a binder, an ionically conductive solid, and a hygroscopic powder.

The Examiner acknowledges that Fenton '136 fails to teach "fine powders having an aspect ratio of 50 to 2,000", but asserts that the invention as a whole would have been obvious to one of ordinary skill in the art because "the courts have held that where the only difference between the prior art and the claimed invention was a recitation of relative dimensions... of the claimed device...the claimed device was not patentably distinct from the prior art device".

Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness. To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Additionally, there must be a reason why one of ordinary skill in the art would modify the reference or combine reference teachings to obtain the invention. A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. *KSR Int'l Co. v Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007). There must be a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. *Id.* The Supreme Court of the United States has recently held that the "teaching, suggestion, motivation test" is a valid test for obviousness, albeit one which cannot be too rigidly applied. *Id.* Rejections on obviousness grounds cannot be sustained by mere

conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. *Id.*

Contrary to the Examiner's assertion, the difference between the prior art and the claimed invention is not a mere recitation of relative dimensions. The present invention is directed, *inter alia*, to an ion exchange membrane comprising a porous film and a surface layer, wherein the pores of the porous film are filled with a crosslinked ion exchange resin and the surface layer comprises a crosslinked ion exchange resin and a lamellar particle having an aspect ratio of 50 to 2,000. Fenton '136 fails to teach or suggest an ion exchange membrane comprising a crosslinked ion exchange polymer or a lamellar particle having an aspect ratio of 50-2,000.

The composite membrane of Fenton '136 is manufactured by dissolving a binder in an organic solvent and impregnating a porous polymeric matrix with the obtained solution mixture (see Fenton '136 at column 7, lines 28-38). Fenton '136 discloses that the composite membrane is manufactured by using 5% NAFION ® solution as a solution of a binder in an organic solvent. Fenton's ion exchange resin, which is dissolved in an organic solvent, is not a crosslinked ion exchange resin.

Applicants have discovered that an ion exchange resin obtained by blending a crosslinkable monomer becomes insoluble and has improved stability (see, for example, Applicants' Specification at page 15, lines 23-27). Thus, the inventive ion exchange membrane of the present application comprises a porous film having pores filled with a crosslinked ion exchange resin, and a surface layer also comprising a crosslinked ion exchange resin. Fenton '136 fails to teach or suggest the use of crosslinked ion exchange resins in the polymeric and protective layers.

Additionally, Applicants submit that Fenton '136 fails to teach or suggest a surface layer comprising a lamellar particle having an aspect ratio of 50-2,000. Lamellar particles are composed of fine, alternating layers of different materials in the form of lamellae. Applicants have discovered that an ion exchange membrane having excellent methanol impermeability can be obtained by using a lamellar particle having an aspect ratio of 50 to 2,000 (see, for example, Applicants' Specification at page 9, lines 21-27). As is known in the art, it is extremely difficult to obtain a high output from a direct methanol type fuel cell when methanol impermeability is low. When a conventional ion exchange membrane is used as a diaphragm for a fuel cell, it is impossible to completely prevent methanol in the fuel chamber from being diffused into the oxidizing agent chamber and it is difficult to obtain high output from the cell (see Applicants' Specification at page 2, lines 21-30 and page 9, lines 21-27). Fenton '136 does not disclose or suggest the use of lamellar particles. Consequently, it is obvious that Fenton '136 cannot possibly teach or suggest the use of lamellar particles having the specific aspect ratios presently claimed.

Evidently, the cited reference fails to teach or suggest every limitation of the instant invention. Consequently, this rejection should be withdrawn.

Reconsideration and withdrawal of this rejection are thus respectfully requested.

Claims 15-16

Claims 15-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fenton '136 in view of Roark et al. (U.S. 7,001,446) (hereinafter Roark '446). Applicants respectfully traverse.

The Examiner asserts that Roark '446 teaches a protective layer applied to a membrane to protect a catalyst from the "detrimental effects of feedstream and other contaminants". The Examiner further asserts that Roark '446 teaches that a protective layer of porous perovskites can be used to protect the membrane from poisoning. The Examiner argues that one of ordinary skill in the art would be motivated to use the protective layer materials of Roark '446 for the protective layer of Fenton '136 "to decrease fuel (feedstream) crossover".

Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness. As previously discussed, Fenton '136 fails to teach or suggest an ion exchange membrane comprising a porous film and a surface layer, wherein the pores of the porous film are filled with a crosslinked ion exchange resin and the surface layer comprises a crosslinked ion exchange resin and a lamellar particle having an aspect ratio of 50 to 2,000. Roark '446 fails to cure these deficiencies.

Roark '446 is directed to a hydrogen-permeable membrane for separation of hydrogen from hydrogen-containing gases. Roark '446 does not disclose or suggest the inventive ion exchange membrane of the present application.

Evidently, the cited references, alone or in combination, fail to teach or suggest every limitation of the instant invention. For this reason alone, this rejection should be withdrawn.

Furthermore, assuming *arguendo* that Roark '446 cured the deficiencies of Fenton '136, it is noted that references cannot be arbitrarily combined. There must be some reason why one of ordinary skill in the art would be motivated to make the proposed combination of the primary and secondary references. *KSR Int'l Co. v Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007). Courts have clearly established that, even when a combination of references teaches every element of a

claimed invention, a rejection based on a *prima facie* case of obviousness is improper absent a motivation to combine. *Id.*

Fenton '136 is directed to porous membranes, whereas Roark '446 is directed to a non-porous multi-layer membrane. One skilled in the art would not be motivated to modify the porous layers of Fenton '136 by using the materials disclosed by Roark '446 for non-porous membranes.

Because the invention, as set forth in Applicants' claims, is not disclosed or made obvious by the cited prior art, reconsideration and withdrawal of this rejection are respectfully requested.

Conclusion

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections and objections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action and, as such, the present application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Marc S. Weiner, Reg. No. 32,181 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

By 

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